



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/630,950 | 07/30/2003 | Clifford E. Lucas | 06401 USA | 1784 |

23543 7590 09/24/2004

AIR PRODUCTS AND CHEMICALS, INC.
PATENT DEPARTMENT
7201 HAMILTON BOULEVARD
ALLENTOWN, PA 181951501

EXAMINER

LEUNG, RICHARD L

ART UNIT PAPER NUMBER

3744

DATE MAILED: 09/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|--------------------------------------|-------------------------------------|
| Office Action Summary | Application No. 10/630,950 | Applicant(s) LUCAS ET AL. |
| | Examiner Richard L. Leung | Art Unit 3744 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-17 and 20-24 is/are rejected.
- 7) ☒ Claim(s) 7, 18 and 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4, 6, 8, 13, 16, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6324848 B1 (Gladden et al.). Gladden et al. disclose a system and method for regulating a multi-stage compressor 20 with a first stage 32 and second stage 34 connected on a single shaft to turbine 18 comprising at least one recycle pressure relief device, valves 60, that are in fluid communication with each gas outlet 38 and 42 of the compressor stages 32 and 34 and are adapted to receive at least one stream of a compressed gas having a discharge pressure from the gas outlets, and at least one conduit, bypass ducts 48 and 50, in fluid communication with at least one gas inlet 36 or 40 whereby the gas inlets receive the stream of compressed gas transmitted to the conduit from the recycle pressure relief device 60 when discharge pressure reaches a designated pressure. It is also disclosed that there are additional pressure relief devices (represented by valves 60 and bypass ducts 46, 52, 54, 56, and 58) in fluid communication with the gas outlets adapted to receive an additional stream of the compressed gas (see particularly column 4). In operation, valves 60 controlling bypass ducts 46-58 are opened in response to one or more operating parameters reaching a designated range (i.e. conditions of compressor surge), such as discharge pressure

Art Unit: 3744

(see columns 4-5), such that at least a portion of compressed gas leaving the outlets 38 or 42 of compressor stages 32 and 34 is recirculated to the inlets 36 or 40 of the compressor stages (see column 5).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2, 3, 5, 9-12, 14, 15, 17, and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 4033735 (Swenson) in view of US 6324848 B1 (Gladden et al.). Swenson discloses a system for liquefying natural gas, which is considered equivalent to a baseload LNG plant, comprising a refrigerant compressor 18 driven by a single-shaft turbine 60, and further comprising a vessel, refrigerant suction drum 50, in fluid communication with a conduit 58 leading to the compressor 18 inlet (see column 5, lines 20-27). Swenson fails to disclose the use of a recycle pressure relief device in fluid communication with the gas outlet of the compressor whereby compressed gas is recirculated from the gas outlet to the gas inlet of the compressor when the discharge pressure reaches a designated pressure, as required by the claims. As already discussed above, Gladden et al. teach a system comprising a multi-stage gas compressor 20 driving by a single-shaft gas turbine 18 having pressure relief devices, valves 60, arranged in fluid communication with the outlets and inlets of the compressor by way of bypass conduits 48 and 50, such that valves 60 may open in

Art Unit: 3744

response to the discharge pressure reaching a designated value (i.e. surge conditions), allowing compressed gas exiting the compressor to recirculate to the inlet of the compressor. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included in the natural gas liquefying process disclosed by Swenson, the multi-stage compressor and control arrangement taught by Gladden et al. because Gladden et al. demonstrates that such an arrangement prevents compressor surging. More specifically, the compressor 18 and turbine 60 arrangement of Swenson could be replaced with the compressor 20 and turbine 18 of Gladden et al., and the bypass duct 48 or 50 with controlling valve 60 taught Gladden et al. could be connected with conduit 52 of Swenson leading to suction drum 50, which removes any liquid entrained in the gas flow to the compressor inlet and potentially damaging to the compressor.

Allowable Subject Matter

5. Claims 7, 18, 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 2470565 (Loss): discloses a surge preventing device for a centrifugal compressor comprising a relief port and channel connecting the output of the compressor with the input of the compressor, the channel being regulated by a pressure-actuated valve apparatus.

Art Unit: 3744

US 4203701 (Abbey): discloses a control for centrifugal compressors comprising a recycle line between the discharge and suction ends of the compressor.

US 4230437 (Bellinger et al.): discloses a compressor control system wherein gas is recirculated from the discharge outlet of a compressor to the suction inlet of the compressor.

US 5002459 (Swearingen et al.): discloses a control system for a compressor comprising a bypass passage controlled by a valve that returns flow from the outlet of the compressor to the inlet of the compressor.

US 6394764 B1 (Samurin): discloses a gas compression system comprising a compressor and conduits for diverting compressed gas from the outlet of the compressor back to the inlet of the compressor.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard L. Leung whose telephone number is 703-306-4154. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Denise L. Esquivel can be reached on 703-308-2597. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

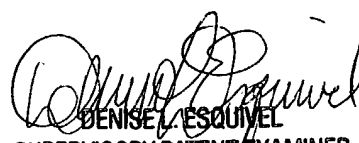
Application/Control Number: 10/630,950

Page 6

Art Unit: 3744

Richard L. Leung
Examiner
Art Unit 3744

rl


DENISE L. ESQUIVEL
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3700